CLAIMS

In the claims:

1. A method for use with a probe which produces a signal indicative of the light absorption of arterial blood at a first light wavelength and at a second light wavelength, comprising:

processing said signal to obtain a plurality of data sets, each of said data sets including first and second data values which are indicative of the light absorption of the blood at the first light wavelength and at the second light wavelength, respectively;

employing said plurality of data sets to calculate a best-fit function;

utilizing said best-fit function and said plurality of data sets to obtain a correlation coefficient indicative of a degree of correlation between said plurality of data sets and the best-fit function; and

determining whether said correlation coefficient indicates a probe-off condition.

2. The method of Claim 1, further comprising:

generating an error indication indicative of the presence of invalid data values in said plurality of data sets when said correlation coefficient is outside of a predetermined range; and

displaying said error indication indicative of said probe-off condition to a user of said probe.

3. The method of Claim 1, wherein said processing step comprises:

processing each of a plurality of successive first sets of successive samples of a first signal component of said signals indicative of the light absorption of the blood at the first wavelength, and each of a corresponding plurality of successive second sets of successive samples of a second signal component of the signals indicative of the light absorption of the blood at the second wavelength, wherein corresponding ones of said samples of the first and second signal components are obtained in a common one of a corresponding plurality of successive time intervals, and wherein said corresponding plurality of successive time intervals is cumulatively less than a corresponding patient pulse period.

4. The method of Claim 3, wherein said corresponding plurality of successive time intervals is cumulatively less than about one second.

5. The method of Claim 3, wherein said processing step further comprises:

obtaining an approximated derivative for each of said plurality of successive first sets of successive samples of the first signal component, and an approximated derivative for each of said plurality of successive second sets of successive samples of the second signal component.

6. The method of Claim 5, wherein each of said plurality of successive first sets of successive samples of the first signal component comprises two samples obtained in corresponding successive time intervals, and wherein each of said plurality of successive second sets of successive samples of the second signal component comprises two samples obtained in corresponding successive time intervals, and wherein said obtaining step comprises:

differentiating between said two samples comprising each of said plurality of successive first sets, and between said two samples comprising each of said plurality of successive second sets.

7. The method of Claim 3, wherein each of said plurality of successive first sets of successive samples of the first signal component comprises two samples obtained in corresponding successive time periods, and wherein each of said plurality of successive second sets of successive samples of second signal component comprises two samples obtained in corresponding successive time intervals, and wherein said processing step comprises:

computing a logarithmic difference between said two samples comprising each of said plurality of successive first steps, and between said two samples comprising each of said plurality of successive second sets.

8. A method for determining oxygen saturation of hemoglobin in arterial blood using signals received from a probe, which signals are indicative of the light absorption of arterial blood, which has pulsatile and non-pulsatile components, at each of a respective one of two light wavelengths, said method comprising the steps of:

producing, in response to said signals received from said probe, a series of sets of data values, each of said sets including first and second data values, which are indicative of the light absorption of arterial blood at a respective one of said two light wavelengths, said producing step including:

processing each of a plurality of successive first sets of successive samples of a first signal component of said signals indicative of the light absorption of the blood at the first wavelength, and each of a corresponding plurality of successive second sets of successive samples of a second signal component of the signals indicative of the light absorption of the blood at the second wavelength, wherein corresponding ones of said samples of the first and second signal components are obtained in a common one of a corresponding plurality of successive time intervals, and wherein said corresponding plurality of successive time intervals is cumulatively less than a corresponding patient pulse period;

storing a plurality of said sets of first and second data values;

computing a ratio of an effective optical extinction coefficient of said pulsatile component of said arterial blood at a first one of said two light wavelengths to an effective optical extinction coefficient of said pulsatile component of said arterial blood at a second one of said two light wavelengths, said ratio being determined by regression analysis of n data points, each data point corresponding with one of said stored plurality of sets of data values, wherein n is a positive integer greater than 2; and

determining oxygen saturation of said hemoglobin using said ratio.

9. The method of Claim 8, wherein said computing step comprises:
determining a linear regression fit for said points.

10. The method of Claim 9, wherein said ratio is determined by a slope of said liner regression fit.

11. The method of Claim 10, wherein each of said n data points comprises first and second data values from one of said stored plurality of sets of data values.

12. The method of Claim 9, wherein each of said first data values is determined utilizing at least a different pair of successive samples of the signals corresponding with said first light wavelength, and wherein each of said second data values is determined utilizing at least a different pair of successive samples of the signals corresponding with said second light wavelength.

13. A method for measuring concentrations of hemoglobin analytes in arterial blood using a probe which produces a signal indicative of the light absorption of arterial blood at a first light wavelength and at a second light wavelength, comprising:

processing each in a plurality of successive first sets of successive samples of a first signal component of said signal indicative of the light absorption of the blood at the first wavelength, and each of a corresponding plurality of successive second sets of successive samples of a second signal component of the signal indicative of the light absorption of the blood at the second wavelength, wherein corresponding ones of said samples of the first and second signal components are obtained in a common one of a corresponding plurality of successive time intervals, and wherein said processing provides for the obtainment of an approximated derivative for each of said plurality of successive first sets and an approximated derivative for each of said plurality of successive second sets to combinatively define a plurality of data sets, each of said data sets including first and second data values which are indicative of the light absorption of the blood at the first light wavelength and at the second light wavelength, respectively; and

employing said plurality of data sets in a linear regression analysis to obtain a linear regression fit for use in determining the concentration of at least a first hemoglobin analyte in the arterial blood;

utilizing said linear regression fit and said plurality of data sets to obtain a correlation coefficient indicative of a degree of correlation between said plurality of data sets and the linear regression fit; and

determining whether said correlation coefficient indicatives a probe-off condition.

14. The method of Claim 13, further comprising:

generating an error indication when said correlation coefficient is outside of predetermined range.

15. The method of Claim 13, wherein said correlation coefficient is a linear correlation coefficient.